| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/734,228 | 12/11/2000 | Helmut Lucke | 450117-02965 | 5435 |

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| 20999 | 7590 | 04/21/2006 | EXAMINER | |

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|---|---|
| EXAMINER | |
| JACKSON, JAKIEDA R | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2626 | |

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 09/734,228 | LUCKE, HELMUT |
| | Examiner | Art Unit | |
| | Jakieda R. Jackson | 2626 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on <u>04 April 2006</u>.

2a) ☐ This action is **FINAL**.    2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) <u>1,2,4-7,9-12 and 14-21</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-2, 4-7, 9-12 and 14-21</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All  b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1.      A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection.  Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.  Applicant's submission filed on February 27, 2006 has been entered.

### *Response to Arguments*

2.      Applicant argues that the embodiments of the present invention provide for the use of not only semantic information, but also for pragmatic information contained in a reliably recognizable part of the speech phrase that is useful to explain another part of higher perplexity.  Applicant argue that the prior art individually or in combination fail to teach or suggest that pragmatic information contained in the at least one low-perplexity part with respect to at least one of the high-perplexity part may be used to explain the at least one of the high-perplexity part.  However, applicant's arguments are not persuasive.

Ehsani teaches that the operation of a voice-interactive application entails processing acoustic, syntactic, semantic, and pragmatic information derived from the user input in such a way as to generate a desired response from the application (column 11, paragraph 0216).  Ehsani also teaches that if n-gram is part of a larger

string collocation the choice of words adjacent to the phrase boundary will be very

small, because of the internal constraint of the collocation.  Conversely, the likelihood

that a particular word will follow is very high.  For example, the word following the

trigram "to a large" will almost always be "extent" which means the perplexity us low,

and the trigram is subsumed under the fixed collocation "to a large extent."  On the

other hand, a large number of different words can precede or follow the phrase "to a

large extent", and the probability that any particular word will follow is very small (close

to 0), columns 5-6, paragraph 0102.

## *Claim Rejections - 35 USC § 103*

3.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.      **Claims 1-2, 4-5, 9, 14 and 18-21** are rejected under 35 U.S.C. 103(a) as being

unpatentable over Jiang et al. (U.S. Patent No. 6,539,353), hereinafter referenced as

Jiang in view of Ehsani et al. (U.S. Publication No. 2002/0128821), hereinafter

referenced as Ehsani and in further view of Kimura et al. (USPN 6,067,510), hereinafter

referenced as Kimura.

As per **claims 1 and 14**, Jiang discloses a method and apparatus for recognizing speech, comprising:

(a) the steps of receiving a speech phrase (100, FIG. 2);

(b) generating a signal being representative to said speech phrase using A/D converter (102, FIG.2);

(c) using feature extractor for pre-processing and storing said signal (104, FIG. 2);

(d) generating from said pre-processed signal at least one series of hypothesis speech elements (Col. 1, line 51-53);

(e) determining at least one series of words being most probable to correspond to said speech phrase by applying a predefined language model to at least said series of hypothesis speech elements (Col. 4, lines 13-16),

wherein the step of determining said series of words further comprises the steps of:

(1) identifying a hypothesis string consisting of sub-word units (Col. 1, lines 52-55) then continuing determining words or combinations of words and which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase (Col. 6, lines 38-46 with Col. 5, lines 28-51 and Col. 4, lines 33-44), but lacks identifying and extracting word classes of high-perplexity, applying a compiler, merging the sub-word-unit grammars with the remaining low-perplexity part and inserting additional information.

Ehsani discloses phrase-based dialogue modeling method for producing a low-perplexity recognition grammar from a conventional grammar having semantic information including a description between sub-phrases (column 3, paragraphs 0034-0043) comprising:

(a) identifying and extracting word classes (trigram subsumed under the fixed collocation) of high-perplexity (very high perplexity) from the conventional grammar (column 5, paragraphs 0100-0102);

(b) generating a phonetic, phonemic and/or syllabic description (phone models and phonetic dictionary; column 11, paragraph 0217) of high-perplexity word classes (very high perplexity), in particular by applying a sub-word-unit grammar compiler to them (column 11, paragraphs 0211-0214 with column 10, paragraphs 0199-0200), to produce a sub-word-unit grammar for each high-perplexity word class (column 5, paragraphs 0100-0102);

(c) merging sub-word-unit grammars (combining) with remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar (column 4, paragraphs 0064 with column 6, paragraph 0107), to measure the strength of certain collocations;

wherein said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech that are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search (column 3, paragraph 0059, column 5, paragraph 100 and column 11, paragraph 0221).

wherein said at least one series of words ("to a large") substantially comprises at least one low-perplexity part ("extent") which can be analyzed and recognized with a high degree of reliability, and remaining parts which are treated as high-perplexity parts (large number of different words; columns 5-6, paragraph 0102), and

wherein pragmatic information contained in said at least one low-perplexity part (column 11, paragraph 0216) with respect to at least one of said high-perplexity parts may be used to explain said at least one of said high-perplexity parts (columns 5-6, paragraph 0102).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang's method wherein it identifies and extracts word classes of high-perplexity, applies a compiler, merges the sub-word-unit grammars with the remaining low-perplexity part and constrain the search and provides pragmatic information contained in a reliably recognizable part of the speech phrase that is useful to explain another part of higher perplexity, to measure for determining the average branching factor of a recognition network, for evaluating language models (column 5, paragraph 0100) to generate a desired response from the application (column 11, paragraph 0216).

Jiang in view of Ehsani discloses a method and apparatus for recognizing speech, but does not specifically teach inserting additional information.

Kimura teaches inserting additional, higher order information (hierarchy), including semantic (semantic features), between the sub-phrases, thereby decreasing the burden of searching (greatly reduce labor and time to search; column 3, lines 43-

51), wherein the semantic information includes description of the sub-phrases (column 5, lines 38-56 with column 12, lines 22-26 and column 15, line 36-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang in combination with Ehsani's method and apparatus such that it discloses inserting additional information, to sort and display words hierarchically in a particular order when displaying the words as candidates for substitution so that a time for retrieving the words can be reduced, as taught by Kimura (column 2, lines 1-6).

As per **claim 2**, Jiang et al. disclose the use of a language model (110, FIG. 2) to provide additional information about the set of probabilities that a particular sequence of words will appear in the language of interest (Col. 4, lines 33-44)

As per **claims 4 and 5**, Jiang et al. discloses that language model (110, FIG- 2) is a compact trigram model that determines the probability of sequence of words based on the combined probabilities of three-word segment of the sequence. (Col.4, lines 41-44). Inherently, trigram language models take prepositional relationships of sub-phrases into account when calculating probabilities.

As per **claim 9**, Jiang et al. discloses the use of Hidden Markov Models for estimating probabilities for any sequence of sub-words generated by lexicon (Col. 4, lines 23-30).

As per **claim 15**, Jiang discloses a method and apparatus for recognizing speech, but does not specifically include information relating to grammatical constraints among said sub-seed.

Ehsani discloses a speech recognition method and apparatus including

information relating to grammatical constraints among said sub-seed (column 11,

paragraph 0221), to narrow down the hypotheses generated by the acoustic signal.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Jiang's method and apparatus wherein it

includes information relating to grammatical constraints among said sub-seed, to narrow

down the hypotheses generated by the acoustic signal, to come up with a number of

possible commands that are processed by the system (column 11, paragraph 0221).

As per **claim 16**, Jiang discloses a method and apparatus for recognizing

speech, but does not specifically include grammatical constraints for a name of a city.

Ehsani discloses a speech recognition method and apparatus including

grammatical constraints for a name of a city (column 10, paragraph 0196), to enable the

phrase thesaurus to be represented more compactly.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Jiang's method and apparatus wherein it

includes grammatical constraints for a name of a city, to enable the phrase thesaurus to

be represented more compactly thus decreasing the data storage capacity required to

store the data representing the phrase thesaurus (column 10, paragraph 0197).

As per **claim 17**, Jiang disclose a method and apparatus for recognizing speech,

but does not specifically discloses pragmatic information including digital postal code for

the city.

Ehsani teaches that the descriptors include businesses, restaurants, cities, etc. (column 10, paragraph 0196), to enable the phrase thesaurus to be represented more compactly.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang's method and apparatus such that it includes a 5-digit postal code for the city, to allow the information to be received hierarchically with a large variety of different domains (column 2, paragraph 0022).

As per **claims 18 and 20**, Jiang disclose the method and apparatus for recognizing speech, but lacks wherein said seed sub-phrase recognized with an appropriate high degree of reliability is defined as a low perplexity part of said received speech phrase.

Ehsani disclose the method wherein said seed sub-phrase recognized with an appropriate high degree of reliability is defined as a low perplexity part of said received speech phrase (column 3, paragraphs 0034-0043 with column 4, paragraphs 0064 and column 6, paragraph 0107), to measure the strength of certain collocations. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang's method and apparatus wherein said seed sub-phrase recognized with an appropriate high degree of reliability is defined as a low perplexity part of said received speech phrase, as taught by Ehsani, to measure for determining the average branching factor of a recognition network, for evaluating language models (column 5, paragraph 0100).

As per **claims 19 and 21**, Jiang discloses the method wherein perplexity is defined as the complexity of the depth of search which has to be accomplished in conventional search graphs or search trees (column 4, lines 45-57).

5.      **Claims 6-7 and 10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang in view of Ehsani and Kimura, as applied to claims 1 and 14 above, and in further view of Chou et al. (U.S. Patent No. 5,797,123), hereinafter referenced as Chou.

As per **claim 6 and 7**, Jiang in view of Ehsani and Kimura does not disclose the use of low-perplexity and high-perplexity pads in the system.

Chou teaches limited vocabulary word spotting (low perplexity) with a parallel network of subword models used to model the non-keyword portions of the input utterance (high-perplexity) (Col. 2, lines 61-65). Inherently, sub-word models contain word fragments.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang in combination with Ehsani and Kimura's method and apparatus, as taught in Chou, in order to improve the speed of recognition by quickly identifying commonly-used words using low-perplexity vocabulary and then proceeding to identify the less-common words by resorting to more expansive computations.

As per **claim 10**, Jiang in view of Ehsani and Kimura does not disclose the insertion of high-perplexity word classes into hypothetic graph.

Chou teaches the insertion of functional words and filler phrases into the detection network to improve recognition of key-phrases (Col. 6, lines 47-56).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang in view of Ehsani and Kimura's method and apparatus, as taught in Chou, in order to handle repeating speech patterns and thus speed up the search and improve recognition.

As per **claim 11**, Jiang in view of Ehsani and Kimura do not disclose the removal of candidates from the hypothetical graph.

Chou teaches the merging of the states of the key-phrase network, thus reducing its size (Col. 7, lines 40-46).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang combination with Ehsani and Kimura method and apparatus, as taught in Chou, in order to prune the passed nodes while doing the search through the hypothetical network and thus limit the possibility to accidentally encroach upon the beginning of another phrase.

As per **claim 12,** Jiang in view of Ehsani and Kimura do not disclose restricting the remaining part of the key-phrase.

Chou teaches placing additional constraints on the search that inhibit impossible connections of key-phrases (Col. 6, lines 64-65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jiang in combination with Ehsani and Kimura method and apparatus, as taught in Chou, in order to improve the speed of recognition by quickly removing impossible combinations from the search graph and thus limiting the search space.

## Conclusion

6.     Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jakieda R. Jackson whose telephone number is 571.272.7619. The examiner can normally be reached on Monday through Friday from 7:30 a.m. to 5:00p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on 571.272.7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

JRJ                                                April 14, 2006

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